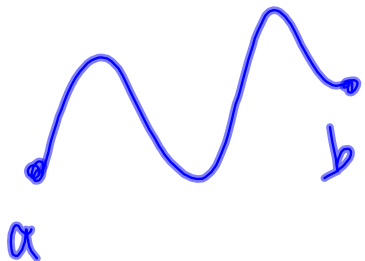


5/10/17 "Some people ask 'Why?', I ask 'Why not?'" -Anonymous

HW: Test 2 on Thursday 5/18

AIM: How do we find the length of curves?

⊗
$$\text{Length} = \int_a^b \sqrt{1 + (f'(x))^2} dx$$



Find the length of each function on the domain given.

1. $f(x) = x^{3/2}$ on $[0, 1]$ — $f'(x) = \frac{3}{2}x^{1/2}$

2. $f(x) = 2(x - 1)^{3/2}$ on $[1, 5]$

3. $f(x) = \frac{x^3}{6} + \frac{1}{2x}$ on $[1, 3]$

4. $f(x) = \ln(\cos x)$ on $\left[0, \frac{\pi}{4}\right]$

1) $f(x) = x^{3/2}$
 $f'(x) = \frac{3}{2}x^{1/2}$

Length = $\int_0^1 \sqrt{1 + \left(\frac{3}{2}x^{1/2}\right)^2} dx$

NORMAL FLOAT AUTO REAL DEGREE MP

$$\int_0^1 \left(\sqrt{1 + \left(\frac{3}{2}x^{1/2} \right)^2} \right) dx$$

.....1.439709873

$$\int_0^1 \left(\sqrt{1 + (Y_2)^2} \right) dx$$

.....1.439709275

■

Answers:

1) 1.440 2) 16.597 3) 4.667 4) 0.881

ex: The length of the curve $y = x^3$ from $x = 0$ to $x = 2$ is given by

$$\begin{array}{lll} \text{(A)} \int_0^2 \sqrt{1+x^6} dx & \text{(B)} \int_0^2 \sqrt{1+3x^2} dx & \text{(C)} \pi \int_0^2 \sqrt{1+9x^4} dx \\ \text{(D)} 2\pi \int_0^2 \sqrt{1+9x^4} dx & \text{(E)} \int_0^2 \sqrt{1+9x^4} dx & \end{array}$$

Answer: E

Which of the following gives the best approximation of the length of the arc of $y = \cos(2x)$ from $x = 0$ to $x = \frac{\pi}{4}$?

- (A) 0.785 (B) 0.955 (C) 1.0 (D) 1.318 (E) 1.977

$$\text{Length} = \int_0^{\frac{\pi}{4}} \sqrt{1 + (-2\sin(2x))^2} dx$$

Answer: D

3) Find the length of $y = x^3$ from $x = -1$ to $x = 2$. $y' = 3x^2$

$$\text{Length} = \int_{-1}^2 \sqrt{1 + (3x^2)^2} \, dx$$

$$= 10.178 \text{ units}$$